Role of Nuclear Power in Environmental Strategies
Nuclear Power as a Low Carbon Energy Source in India

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Environmental Strategy

- **Environmental Strategy** is a plan to accomplish specific environmental objectives.
- Balancing environmental health with political/economic priorities.
- **Why Environmental Strategy?**
  - Need to Address
    - Climate change
    - Energy Usage
    - Environmental health
    - Pollution (Air, Water, Land)
    - Environmental degradation
    - Resource depletion
    - Challenges to ecological balance

Economy-Energy-Environment: Inevitable Link

- Environmental Impacts
- Energy Consumption
- Economic Targets

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India: Balancing Economic Development and Environmental Health

- Population 1 billion +, and with GDP growth rate targeted at 9-10 percent, India is a major economy in the global east.

- Need to be a responsible player in the global efforts towards climate change mitigation
The growing demand for energy is met by a mix of fuels including oil, natural gas, coal, nuclear power, hydropower and alternative sources.

The total primary energy demand for the country in 2010 is estimated to be more than 524.2 million tons of oil equivalent (Mtoe). The demand was less than 300 Mtoe in the year 2000.

Reserve / Production of Fuel types (India)
- Oil: 30 Years
- Gas: 28 Years
- Coal: 106 Years
India: Energy Facts

- India to overtake Japan by around 2020 as the world’s third-largest spender on oil imports (EIA)
- India’s primary energy consumption to double by 2035 from that in 2009 levels (480 MMTOE)
- India’s oil import will jump from 2.2 mb/d in 2009 to 6.7 mb/d by 2035
- About 400 million people in India does not have access to electricity
- Renewable still account only for about 1 percent of total commercially traded primary energy supply

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Energy Related CO2 Emission in Asia

<table>
<thead>
<tr>
<th>Year</th>
<th>China</th>
<th>India</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>5,000.00</td>
<td>1,000.00</td>
<td>1,000.00</td>
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<tr>
<td>2006</td>
<td>5,500.00</td>
<td>1,200.00</td>
<td>1,100.00</td>
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<tr>
<td>2007</td>
<td>6,000.00</td>
<td>1,400.00</td>
<td>1,200.00</td>
</tr>
<tr>
<td>2008</td>
<td>6,500.00</td>
<td>1,600.00</td>
<td>1,300.00</td>
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<tr>
<td>2009</td>
<td>7,000.00</td>
<td>1,800.00</td>
<td>1,400.00</td>
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Strategies towards Addressing Climate Change Concerns

- India acceded to Kyoto Protocol in Aug 2002, came into force in Feb, 2005
- Nationally Appropriate Mitigation Actions (NAMA), under BALI ACTION PLAN (2007, UNFCCC)
- India’s 8 Missions under NAPCC to play key role in emission reduction Plans
- India will endeavour to reduce the emissions intensity of its GDP by 20-25% by 2020 in comparison to the 2005 level (India’s Commitment to CoP, UNFCCC)
- Domestic efforts: Supply side (nuclear, alternative sources) and Demand side (energy efficiency and conservation) measures

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Environmental Strategy and Low Carbon Development in India

- Low Carbon Economy/Low Carbon Society: A society that emits less carbon while meeting its economic goals
- Balancing environmental health with economic targets are critical for India
- Developmental Paradox of India
  - Poverty Alleviation -> Economic Development
  - Need for Fossil Fuels -> Increasing Import dependency
  - Need to Develop Alternatives -> Cost/intermittency concerns
  - Growing Energy Demand -> Rise in Energy related emissions

‘Low carbon development’ has emerged to be the key pillar of environment strategy in India
Strategies to put India into the low carbon orbit

- Cutting energy intensive developmental pathways (Industrial, Transport Sectors)
- Reducing fossil fuel dependency
- Promoting low carbon energy technologies
- Increasing the share of alternative sources and Nuclear power in the energy mix
- Energy Transition
Nuclear Power and CO2 Emission

- Nuclear energy is among those energy sources producing very low levels of carbon dioxide emissions from their full life cycle.
- It is closely comparable with renewables such as wind, solar and hydro in this respect. (WNA)

<table>
<thead>
<tr>
<th>g/kWh CO2</th>
<th>Japan</th>
<th>Sweden</th>
<th>Finland</th>
<th>WNA</th>
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<tbody>
<tr>
<td>Coal</td>
<td>990</td>
<td>980</td>
<td>894</td>
<td></td>
</tr>
<tr>
<td>Gas thermal</td>
<td>653</td>
<td>1170</td>
<td>-</td>
<td></td>
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<tr>
<td>Gas combined cycle</td>
<td>-</td>
<td>450</td>
<td>472</td>
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<tr>
<td>Solar photovoltaic</td>
<td>59</td>
<td>50</td>
<td>95</td>
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<tr>
<td>Wind</td>
<td>37</td>
<td>5.5</td>
<td>14</td>
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<td>Nuclear</td>
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<td>610-26</td>
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<td>Hydro</td>
<td>18</td>
<td>3</td>
<td>-</td>
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Source: WNA
Nuclear Power in the Environmental Context in India

- Fuel demand: Meeting the growing energy demand for low carbon development

- Climate Change: Minimising energy related emission that contributes to innumerable effects on environment, agriculture, life on planet, sea level rise, extreme weather conditions.

- Clean-Air Benefits: Reducing energy related air pollution

- Sustainable, low carbon development: critical component for energy transition, low carbon energy mix. (Nuclear technology plays critical role in agriculture, medicine, food preservation, industry and supports sustainable development)

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Inferences

• Nuclear Power is *not a panacea* for Environmental Challenges/ Climate Concerns, however it has significant role to play in the environmental strategies of a country.

• Climate change mitigation is one of the salient reasons for increasingly considering nuclear power in national energy portfolios (IAEA).

• For India, nuclear to continue as a low carbon source, critical to achieving the country’s climate mitigation commitments.

• Nuclear places significant importance in policies towards reducing the reliance of fossil fuels, ensuring energy security, addressing geopolitical concerns on fuel supplies, meeting energy demand for achieving economic growth, eradicating poverty, promoting sustainable development.

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Thank You

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Data Sources used: EIA, Planning Commission (Govt of India), NAPCC (Govt of India), Nuclear Energy Institute (US), IAEA

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